

Executive Institute

CEO Survival Guide™  
**Electronic Health  
Record Systems**  
2006 Edition

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Electronic Health Record Systems

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**Electronic Health**  
**Record Systems**  
2006 Edition



National Quality Forum  
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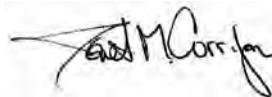
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Electronic health record (EHR) systems are an enabling foundation for healthcare reform, both organizationally and systemwide. Investment in EHR systems leads to significant, demonstrable improvements in safety, quality, and efficiency. Many efforts are under way in both the public and private sectors to accelerate the adoption of EHR systems. However, successful implementation of an EHR system requires sustained leadership. It is the CEO's responsibility, with support from the board of trustees, to articulate a new vision of patient care, and the role of EHR systems in achieving the vision.

The *CEO Survival Guide™ to Electronic Health Record Systems* is one in a series of guides from the National Quality Forum's (NQF) Executive Institute that focuses on the most important policy issues and environmental forces affecting healthcare quality. The guides provide senior executives with up-to-date information on developments at the national and local levels, present all sides of complex issues and the perspectives of multiple stakeholders, and analyze the implications of emerging trends and issues for the delivery of quality healthcare.

This guide provides succinct definitions of EHRs, EHR systems, and their building blocks; summarizes the state of EHR system adoption by physician practices and hospitals, as well as public- and private-sector efforts to speed adoption; outlines the value equation for adoption of EHRs; and lays out a framework for healthcare executives to leverage the full benefit of EHR systems. In addition, the guide includes a set of Tools for Executives—including Q&A, a PowerPoint presentation, and a checklist—to help executives communicate the EHR system imperatives and strategic leadership and organizational responses.

NQF would like to thank the Task Force on Electronic Health Record Systems for its stewardship of this work and its dedication to ensuring that this guide would serve as a useful tool for healthcare executives.



Janet M. Corrigan, PhD, MBA  
President and Chief Executive Officer



# NQF Executive Institute

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The National Quality Forum's (NQF's) Executive Institute is intended to help senior executives and trustees of healthcare organizations respond to key environmental forces that influence health care delivery. It is also a vehicle for executives to take a leadership role locally and nationally in shaping policy around issues in healthcare quality.

*The Executive Institute's CEO Survival Guide™ Series* focuses on some of the most important policy issues and environment forces impacting the quality of healthcare including: standardized performance measurement and public reporting, pay-for-performance programs, and health information technology. *The CEO Survival Guides™*:

- provide up-to-date information on developments at the national and local levels;
- present all sides of complex issues and the perspectives of multiple stakeholders; and
- analyze the implications of emerging trends and issues for the delivery of quality healthcare.

*The CEO Survival Guides™* assist executives in responding to environmental forces in ways that will enhance quality and help them maintain a strategic advantage.

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# Executive Summary

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Electronic health record (EHR) systems are an enabling foundation for healthcare—and organizational—reform. Investment in EHR systems makes possible significant, demonstrable improvements in efficiency and productivity. Their potential to improve the safety and effectiveness of healthcare creates substantial—though more difficult to quantify—value. The benefit of investment in EHR systems will only be fully realized if these systems are interoperable—able to exchange data across providers, sites, and organizations. The adoption of EHR systems by healthcare providers would save an estimated \$70 billion or more annually.

Many efforts are underway in both the public and private sector to accelerate the adoption of EHR systems. The Health and Human Services' Office of the National Coordinator for Health Information Technology is playing a lead role in establishing national data standards to assure interoperability; and coordinating efforts to create regional, and eventually national, health information networks for data exchange.

Public and private purchasers are pursuing both “carrot and stick” approaches to encourage providers to invest in EHR systems. Recognizing that providers bear most of the financial burden of investing in EHR systems, but that many of the benefits accrue to purchasers or society as a whole, many purchasers have implemented pay-for-performance payment programs that provide

financial rewards to providers who invest in high-value EHR system applications, and/or achieve safety and quality performance goals. Additionally, the pay-for-performance and accompanying public reporting programs of purchasers impose significant data reporting burden on providers who do not have EHR systems.

Successful implementation of an EHR system requires sustained leadership. It is the CEO's responsibility, with support from the board of trustees, to articulate a new vision of patient care, and the role of EHR systems in achieving the vision. Investing in an EHR system should be part of a broader strategy for building a high performance health system. The EHR system is a powerful tool, but it is only a tool. Realizing the promise of the technology will require the redesign of clinical care processes and business practices.

EHR system implementation is not all about information technology; it must be about transforming clinical and business practices.

To maximize the likelihood of a smooth transition to an EHR system, and to leverage the full potential of the system, CEOs should:

- **Develop an enterprise-wide health information technology (HIT) plan.** A new vision of patient care should drive the HIT plan. The first investments should be in systems that can be built upon. The

EHR system should be the single source of integrated patient information and connectivity should be the foundation for all specialized applications.

- **Cultivate sponsors.** Successful implementation of an EHR system requires a senior executive team consisting of a physician champion and strong clinical and administrative leaders, in addition to the chief information officer. The senior executive team will play a critical role in the strategy development, sponsorship, organizational preparedness, financing, application selection, implementation, and ongoing management of the EHR system.
- **Multi-year commitment and investment strategy.** Initial capital investment in hardware and software is a small portion of the real cost of implementing an EHR system. The real costs to healthcare organizations are in the training, workflow analyses, short-term productivity losses, and maintenance/upgrades to the system over time.
- **Application selection.** Identifying key decision makers and champions, developing common goals and functionality, and conducting site visits are the foundation for application selection.

- **Ongoing management.** Keys to effective ongoing management of EHR systems include strong and sustained leadership, open and extensive communication, rapid response to problems, ongoing training, reengineered work processes, updated clinical decision-support, and realistic expectations.

EHR implementation is a leadership challenge. Together, healthcare executives, trustees, and physician champions must communicate the need, reinforce the value, and assess the pace at which changes in practice will be accepted in the clinical culture of the organization. Realizing the full potential of EHR systems to contribute to improvements in clinical care and efficiency could take organizations 5 to 10 years. Strong executive and clinical leadership at all levels of the organization will be needed to “stay the course.”

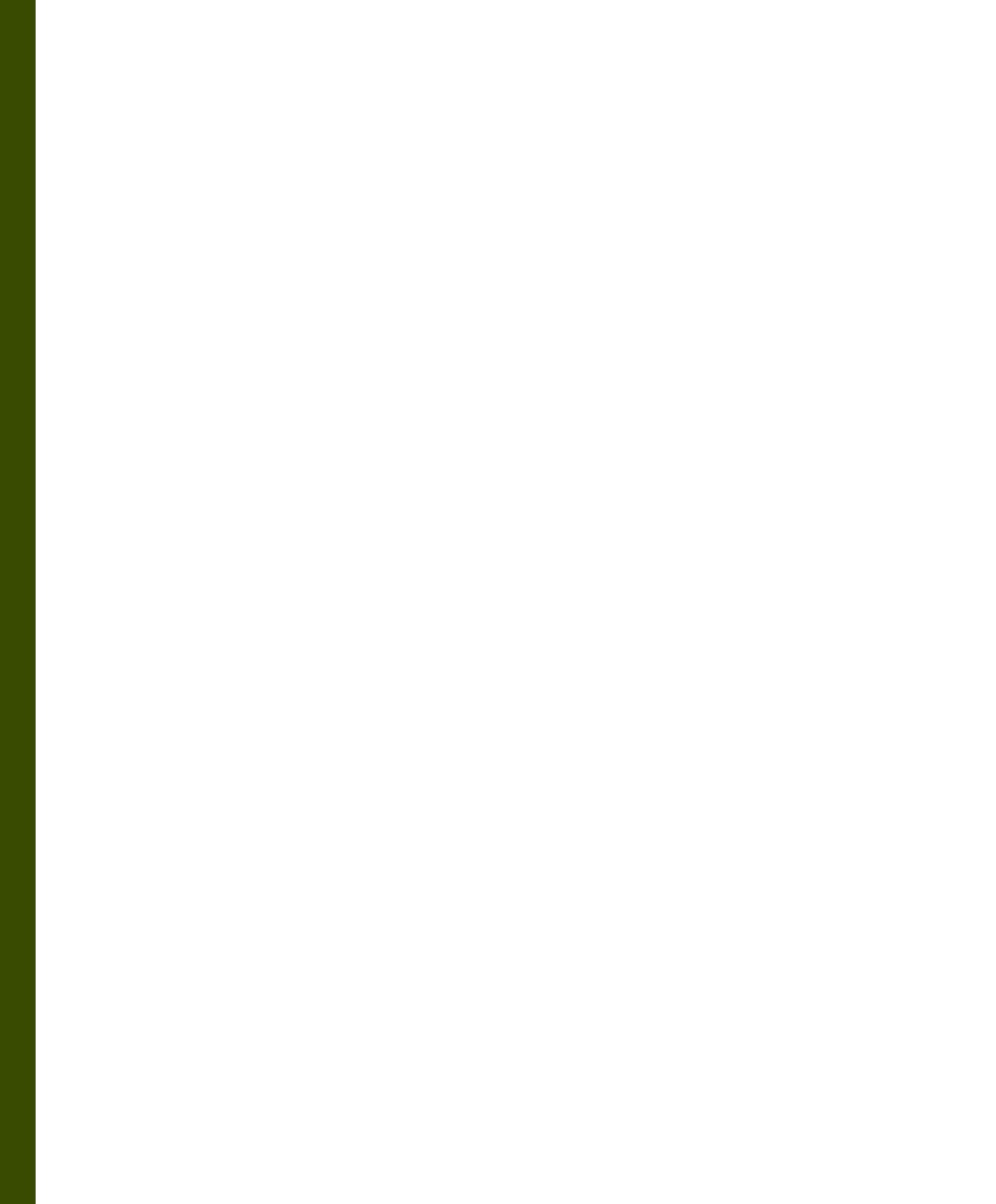
# Tools for Executives

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NQF's Task Force on Electronic Health Record Systems suggests that leveraging Electronic Health Record (EHR) systems to increase quality and efficiency is the work of healthcare executives. These tools provide executives and trustees with an instrument to help communicate the EHR system imperatives and strategic leadership and organizational responses.

The following Tools for Executives are included in this *CEO Survival Guide™* and available online at [www.NQFExecutiveInstitute.org](http://www.NQFExecutiveInstitute.org).

<b>Q &amp; A</b> .....	15
The information briefly summarizes important points about the current environment around EHR systems and the role of healthcare leaders in EHR system implementation.	
<b>PowerPoint Presentation with Speaking Points</b> .....	19
The PowerPoint presentation is offered as a pre-packaged tool for executives to use to communicate with their boards, executive teams, and other stakeholders about EHR systems. Speaking points are included with the slides at <a href="http://www.NQFExecutiveInstitute.org">www.NQFExecutiveInstitute.org</a> to provide executives with a short, cogent communication tool applicable to many audiences.	
<b>Checklist</b> .....	29
The EHR Systems Task Force offers a broad roadmap as a practical tool for executives for implementing EHR systems.	



# Q&A for Electronic Health Record Systems

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## Why are EHR systems necessary?

- EHR systems are increasingly recognized as critical to providing care that is safe and effective, and as doing so in an efficient manner.
- EHR systems provide clinicians and patients with timely access to complete patient information, computerized prompts and reminders to facilitate compliance with evidence-based clinical practice guidelines, and computerized alerts to inform clinicians and patients of potentially hazardous conditions.
- Systemwide benefits from fully functional EHR systems include: increased compliance with preventive care guidelines, better coordination and management of chronic conditions, optimized medication prescribing and administration, reduced adverse drug events, reduced staff time spent on paperwork, reduced redundancy of laboratory and imaging services, and increased accuracy of coding and more timely billing for services.

## What is an EHR system? Is it the same as an Electronic Medical Record (EMR)?

- EHR refers to a computer-based longitudinal record of patient health information intended primarily for use by healthcare providers. EHRs are also called EMRs.
- Personal Health Record (PHR) refers to computer-based patient records intended primarily for use by consumers, which may or may not interface with providers' electronic records.

- An EHR System includes computerized patient records (both EHRs and PHRs), clinical decision support, clinical data repositories, and support for operational and management processes.

## What are the roles and responsibilities of CEOs in EHR system implementation?

- EHR systems open up enormous opportunities to redesign the delivery system.
- It is the CEO's role to articulate the vision for transforming patient care and organizational operations, and to explain the contribution the EHR system is expected to make toward achieving this vision.
- The CEO should lead the process of developing an enterprise-wide plan to build and implement an EHR system that will *support the new vision of patient care*.
- The CEO will need to assemble a top executive team with strong clinical representation to lead the work process transformation that will be necessary to realize the promise of the technology.
- The senior executive team plays important roles in the strategy development, sponsorship, organizational readiness, financing, application selection, implementation, and ongoing management of EHR systems.

## Are many hospitals and physician practices implementing EHR systems right now?

### Physician Practice/Ambulatory Settings

- Most sources estimate physician adoption of EHR systems to be 15 to 25 percent.
- Higher rates of EHR adoption are associated with:
  - Increased size of practice
  - Multi-specialty group practice
  - Ownership by an integrated healthcare delivery system
  - Greater managed care revenue

### Hospitals

- Most hospitals build EHR systems incrementally over a period of many years.
- Four out of five hospitals have already computerized laboratory, pharmacy, and radiology systems, and most feed these data into a clinical data repository that is available to clinicians. Far fewer hospitals have computerized clinical documentation and even fewer provide clinical decision-support to clinicians.
- HIT adoption in hospitals is correlated with:
  - More beds
  - Less Medicare revenue
  - Not-for-profit status
  - Increased managed care involvement
  - Participation in multi-hospital system

## How is EHR adoption being incentivized and accelerated?

- Helping providers select and implement EHRs. The Certification Commission for Healthcare Information Technology will certify EHR systems and their components; Quality Improvement Organizations are providing technical assistance.
- Encouraging adoption of EHRs through P4P and public reporting. EHR investment is becoming critical to participating in, and benefiting financially from, P4P programs.
- Establishing an e-prescribing system for Medicare recipients that requires plans participating in Part D to support electronic prescription programs.
- Building a national health information network. Development of the National Health Information Network is based on certification of EHRs and standards for the secure and seamless exchange of health information.
- Relaxation of Stark Law and anti-kickback statute. The proposed revisions would permit hospitals to provide subsidies to physicians for both e-prescribing and EHR systems.

## Is there a value equation for EHR systems?

### Costs

- Hardware/software costs are a fraction of total costs.
- More important are the costs of training, workflow analyses and changes, short-term productivity losses, and maintenance of clinical decision support tools.

### Benefits

- Enhanced quality and safety of care, leading to fewer adverse events and improved patient outcomes.
- Higher levels of patient and clinician satisfaction.
- Elimination of unnecessary redundancy in ancillary services, reduced transcription costs, and cycle time reductions.
- Enhanced revenue through better coding and timely billing.
- For hospitals—reduced lengths of stay and subsequent increases in volume.

### Return on Investment (ROI)

- There is little quantifiable data in the literature on hospital ROI.
- For small ambulatory practice settings, there is consistency in the literature suggesting a return on investment in less than three years.

### **What should healthcare executives and trustees do to leverage EHR systems?**

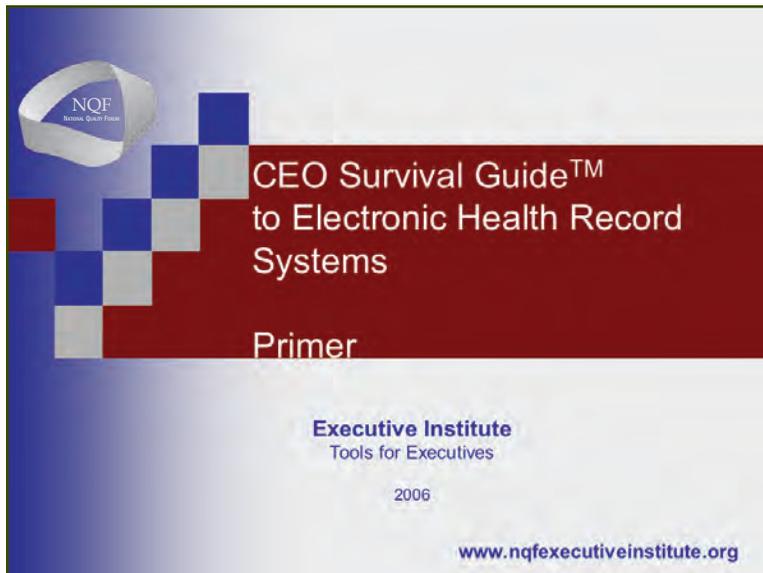
- **Develop enterprise-wide HIT strategic plan.**
  - Develop a common set of goals for the EHR system that link to the organization’s vision for transforming patient care and operations
  - Specify functional requirements for the EHR system
  - Position the EHR system as the single source of patient information
  - Determine implementation strategy (i.e., pace of adoption, ordering of components)
- **Develop near-term and ongoing training plans to assist staff in deriving the greatest benefit from the EHR system**
- **Communicate, communicate, communicate**
  - The vision for transforming care and operations
  - The way in which the EHR system will enable this transformation
  - The expected benefits of the EHR system
  - The implementation plan and challenges
  - The organizational infrastructure that will support the implementation
  - The strong commitment of the board of trustees, CEO, and clinical leadership
- **Identify champions**
  - Assemble a top-level leadership team, including strong clinical champions
  - Educate and engage the board of trustees
  - Cultivate formal and informal leaders at all levels of the organization
- **Implement EHR system and work process transformation**
  - Determine the pace at which changes in clinical care and operational processes will be accepted given the clinical culture and degree of organizational readiness
  - Establish an implementation schedule that is realistic in terms of timing and additional resources required during implementation

- Identify and test the changes to make the implementation easier
- Assess and modify workflow
- **Develop capital and operating budgets**
  - Quantify the expected benefits, costs, and return on investment
  - Develop a multi-year investment strategy and secure a 5-year upfront commitment
  - Consider the cost of inaction
  - Consider the long-range implications of the EHR system and associated changes in work processes for freeing up capacity in terms of beds, equipment, and human resources
- **Select the application**
  - Engage the executive leadership team and clinical champions at all levels in the selection process
  - Identify common goals and the necessary system capabilities to achieve these goals
  - Conduct site visits to organizations similar to yours in size to obtain first hand knowledge of various vendors' systems
  - Develop a long-term relationship with the vendor(s)
- **Implement and fully incorporate the EHR system into clinical and administrative operations**
  - Strong leadership and open communication are critical
  - Make training mandatory
  - Be prepared for initial resistance
  - Respond rapidly to expected and unexpected problems
  - Recognize that time is required for clinicians and staff to fully utilize EHR system capabilities and plan for ongoing training
  - Stay the course
  - Hold clinical and administrative management accountable for results
  - Celebrate successes and reward involvement

# Electronic Health Record Systems PowerPoint Primer With Speaking Points

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*The PowerPoint presentation primer on Electronic Health Record Systems including speaking points can be downloaded from [www.NQFExecutiveInstitute.org](http://www.NQFExecutiveInstitute.org).*



## Electronic Health Record Systems: A Primer

1. EHR Systems are Critical
2. The Value Equation for EHR Systems
3. Efforts to Speed EHR System Adoption
4. Leadership Challenges
5. EHR Systems: Preparing for the Future

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## EHR Systems are Necessary

...to support a vision of  
patient care

...for public reporting of  
quality measures

...for compliance and  
increasingly good  
performance on the  
measure sets

### HIT benefits:

- Safety
- Disease prevention
- Disease management
- Efficiency

Examples include:

- CPOE reduces potential adverse drug events by as much as 84%
- Electronic reminders increase the provision of preventive services
- Disease tracking and compliance with clinical guidelines leads to better outcomes

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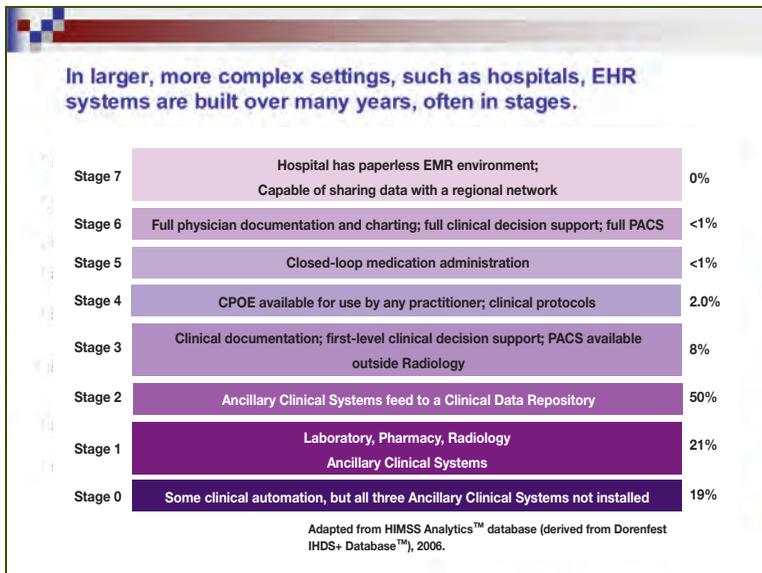
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**Attributes of an EHR System**  
(Adapted from IOM, 1991, 1997)

1. Provides problem lists
2. Health status and functional levels
3. Documents clinical reasoning and rationale
4. Provides longitudinal and timely linkages with other pertinent records
5. Guarantees confidentiality, privacy and audit trails
6. Provides continuous authorized user access
7. Supports simultaneous user views in the EHR
8. Access to local and remote information
9. Facilitates clinical problem solving
10. Supports direct entry by physicians
11. Supports cost measuring/quality assurance
12. Supports existing/evolving clinical specialty needs

The full benefit of investment in EHR systems will only be realized if EHR systems are *interoperable*—able to exchange data across providers, sites and organizations.

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## Value Equation for EHR Systems

**Costs:**  
Hardware/software costs are a fraction of total costs. Consider:

- \$ training.
- \$ workflow analyses and changes.
- \$ short-term productivity losses.
- \$ maintenance of clinical decision support tools.

**Benefits:**

- \$ Fewer adverse events; improved patient outcomes.
- \$ Higher levels of patient and clinician satisfaction.
- \$ Elimination of unnecessary redundancy in ancillary services, reduced transcription costs, and cycle time reductions.
- \$ Enhanced revenue through better coding and timely billing.
- \$ For hospitals—reduced lengths of stay and subsequent increases in volume.

**EHR Costs Versus Benefits Per Provider**

Time Point	Cost (\$)	Benefit (\$)
Initial cost	~\$15,000	~\$10,000
Year 2	~\$15,000	~\$25,000
Year 4	~\$10,000	~\$45,000

Adapted from Wang et al., 2003.

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## Public and Private Efforts to Speed EHR Adoption:

- Helping providers select and implement EHRs
- Encouraging adoption of EHRs through P4P and public reporting
- Establishing an e-prescribing system for Medicare recipients
- Building a National Health Information Network
- Relaxing federal laws (Stark & Anti-kickback)

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## Leadership Imperatives for EHR Systems

- **Develop a vision for patient care**
  
- **Develop an information technology strategic plan that supports the vision of patient care**

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## Leadership Imperatives for EHR Systems, continued.

- **Develop an enterprise-wide strategy for EHR system implementation**
  - High organizational priority and visibility
  - Develop a common set of goals
  - Position the EHR system as the single sources of patient information
  - Determine implementation strategy (big bang versus incremental)
  - Develop training plans
  - Communicate, communicate, communicate

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## Leadership Imperatives for EHR Systems, continued.

### ■ Identify clinical champions

- Physician, nursing, pharmacy, and residents' opinion leaders
- Communicate the need, reinforce the value, and assess the extent and pace of changes in the practice that will be acceptable given the clinical culture of the organization

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## Leadership Imperatives for EHR Systems, continued.

### ■ Implement work process transformations

- Assess and modify workflow
- Perform a thorough analysis of what management actions will be needed in order to achieve the potential benefits of EHRs
- Identify and test the changes to make the implementation easier

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## Leadership Imperatives for EHR Systems, continued.

### ■ **Develop capital and operating budgets**

- Quantify return on investment
- Commit a certain amount of money each year for at least 5 years
- Consider the cost of inaction

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## Leadership Imperatives for EHR Systems, continued.

### ■ **Select the application**

- There are many web-based, vendor-neutral supports and tools for EHR system planning, acquisition, and implementation
- Engage key stakeholders in the selection process
- Develop a long-term relationship with the vendor

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## Leadership Imperatives for EHR Systems, continued.

- **Implement and fully incorporate into clinical and administrative operations**
  - Be prepared for initial resistance but stay the course on the use of an EHR system
  - Ensure changes are made to how care is delivered
  - Conduct ongoing training, including just-in-time and follow-up training to increase the functionality of the system for providers
  - Hold operating management accountable for results

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## Prepare for the Future

- Personal Health Records
- Regional Health Information Networks
- Build relationships with community providers to encourage broader adoption of EHRs and to promote interoperability

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**EHR system  
implementation is not  
all about information  
technology; it is about  
transforming clinical  
and business practices.**

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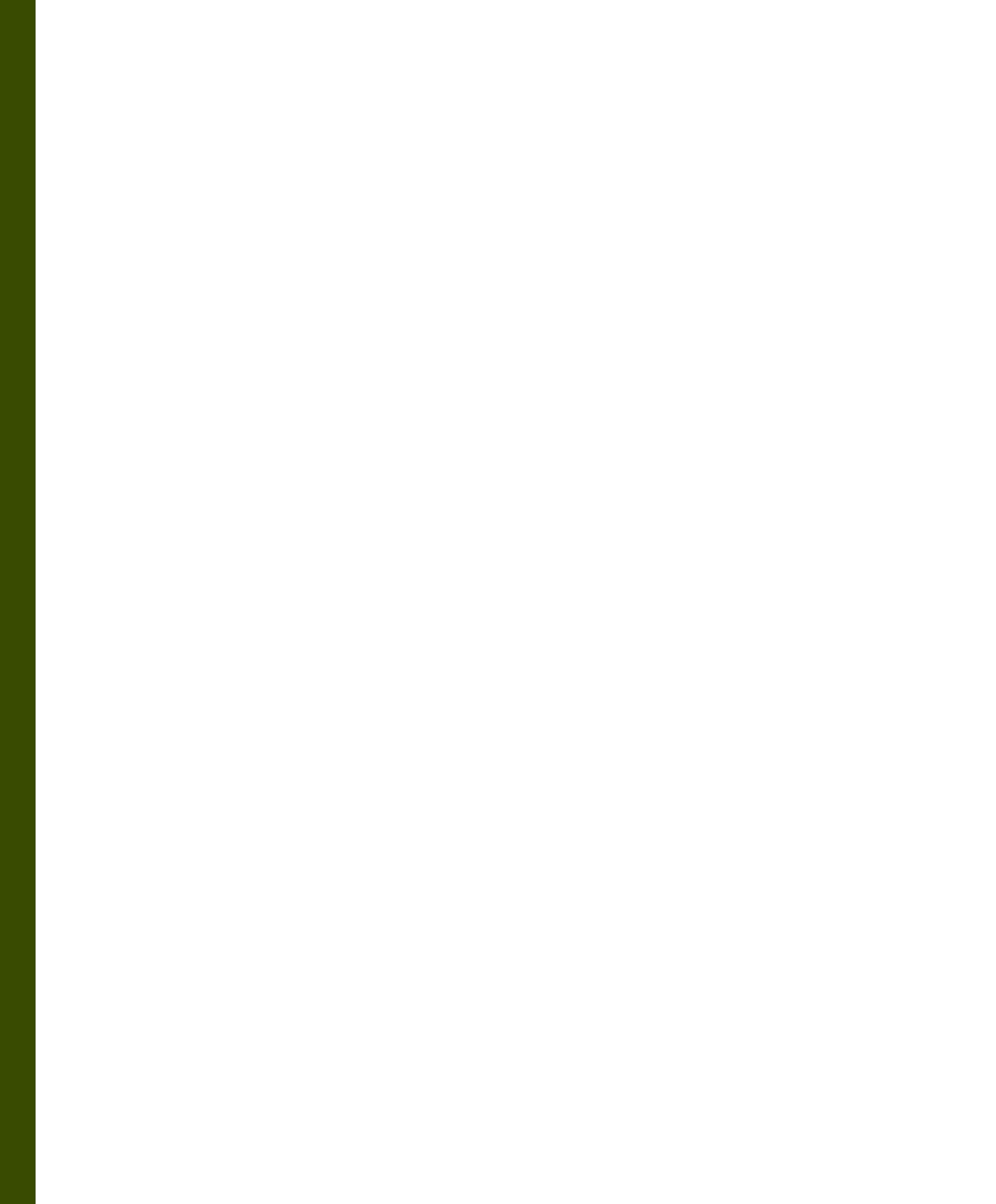
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# Checklist for Electronic Health Record Systems

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## 1. Develop a vision for patient care

- ✓ Develop a patient-focused vision for how care will be provided across a continuum of settings and locations of care.
- ✓ Identify the information requirements to support the safest, most effective and efficient delivery of care.
- ✓ Develop a health information technology strategic plan that supports the vision of patient care and can be used to guide the enterprise-wide planning and management of HIT applications and architecture.

## 2. Understand environmental factors affecting EHR systems

- ✓ Identify P4P programs that incentivize information technology and whether they may become applicable to the organization.
- ✓ Understand organizational resources currently needed to comply with public reporting of quality measures and how EHR systems could positively impact reporting—and performance—on measures.
- ✓ Recognize that e-prescribing is likely to increase significantly with the expansion of Medicare Part D, which provides prescription drug coverage to Medicare beneficiaries.
- ✓ Understand that potential revisions to the Stark and anti-kickback laws would permit hospitals to provide subsidies to physicians for both e-prescribing and EHR systems.

## 3. Become aware of the supports available for EHR system planning, acquisition, and implementation

- ✓ The federal Office of the National Coordinator for Health Information Technology (ONCHIT) has commissioned a Certification Commission to certify HIT products in order to give providers assurance that EHRs have the capabilities and benefits they need.
- ✓ The federal government is focusing on IT adoption by small physician practices through the CMS-sponsored Doctor's Office Quality–Information Technology (DOQ-IT).
- ✓ Medicare QIOs are also providing technical assistance to physician practices, as well as to hospitals.
- ✓ AHRQ is providing grants to communities to facilitate EHR system adoption and implementation.
- ✓ The American Academy of Family Physicians is providing implementation support aimed at smaller physician practices.

#### **4. Develop an EHR system organizational strategy**

- ✓ Healthcare executives and trustees must commit visibly and unwaveringly to the EHR system planning and implementation.
- ✓ Identify a single project leader who works collaboratively and has realistic expectations.
- ✓ Position the EHR system as the single source of integrated patient information; value and efficiency are gained from going paperless. The organization must be clear on the degree to which an EHR system—versus interoperable components—is being implemented.
- ✓ Identify and communicate to providers the “value proposition” associated with EHR system implementation (i.e., the return for the upheaval of doing work differently is the benefit of increased decision-support and improved quality of care for patients).
- ✓ Determine an implementation strategy. A very small, phased implementation may not be robust enough to support the meaningful work process transformations that will ultimately provide efficiency and other quality benefits; while a “big bang” implementation may not be financially feasible or acceptable to key stakeholders.
- ✓ Develop a set of common goals that prioritize the functionality needed in the system and guide decision makers’ understanding and review of available EHR system solutions.

#### **5. Identify clinical champions**

- ✓ Identify physician, nursing, pharmacy, and residents’ opinion leaders and engage them as champions of the initiative.
- ✓ Together, healthcare executives and physician champions must communicate the need, reinforce the value, and assess the degree to which changes in practice will be accepted or mandated in the clinical culture of the organization.
- ✓ Clinical leader champions will be a critical communication link between leadership and users, and will help in making practical, effective and useful decisions, and identify the differences between “what would be nice” and “what is essential for success.”

#### **6. Communicate, communicate, communicate**

- ✓ Develop a shared vision regarding the purpose and need for the implementation and the expected benefits.
- ✓ Set expectations in terms of the immediate, short-term negative impact on productivity and efficiency.
- ✓ Establish trust and dialogue as excellent bi-directional communication between leadership and users.

- ✓ Identify and use formal and informal channels of communication that exist in every organization to address the communication needs of leadership, management, clinicians, and front-line staff.

## 7. Implement work process transformations

- ✓ Engage operational managers or management engineers to assess and modify workflow, clinical informatics specialists to understand and interpret organization-specific clinical realities that will affect use of the new system, and trainers to prepare the workforce.
- ✓ Perform a thorough analysis of what management actions will be needed in order to achieve the potential benefits of EHR systems.
- ✓ Engage in the “pre-work” of reengineering (e.g., identifying order sets, reviewing the evidence) and testing the changes to the extent possible with current systems before EHR implementation.

## 8. Develop training plans

- ✓ Develop training programs that provide up-front training, but recognize that providers will only assimilate a small portion of the available functionality initially.
- ✓ Budget for—and staff for—ongoing, repetitive, just-in-time training for clinicians as they become ready over time to utilize additional functionality in the system.

## 9. Develop capital and operating budgets to support acquisition, implementation, and ongoing management

- ✓ Develop an understanding of all costs involved; recognize that hardware costs and vendor quotes are a small fraction of the total costs to the organization. Training, workflow analyses and changes, short-term productivity losses, and maintenance of clinical decision-support tools will make up the majority of the costs.
- ✓ Understand and quantify the expected benefits of the system, including adverse event reduction, reduced repeated tests, reduced transcription costs, enhanced revenue through better coding, increased health outcomes, cycle time reductions, and—for hospitals—reduced lengths of stay and subsequent increases in volume.
- ✓ Consider the cost of inaction. Not only will performance on quality measures be significantly reduced compared to provider organizations with EHR systems, but providers will be unable to communicate quality data with consumers.
- ✓ Commit to investing a certain amount of money each year for a minimum of 5 years, whether as capital or incurred expenses. Avoid an annual re-negotiation over the amount or validity of the EHR system investment compared to other capital needs.

## 10. Select the application

- ✓ Select key decisionmakers and champions, develop common goals and functionality, and conduct site visits, as these actions are the foundation for application selection.
- ✓ As it becomes available, use Certification Commission for Healthcare Information Technology information to gain some assurance that the EHR systems have the capabilities and benefits needed for the organization.
- ✓ Use the many “vendor-neutral” resources available to hospitals, physician offices, and other provider organizations. These provide detailed education and tools on EHR system solutions and alternatives, the RFP process, negotiation, and contracting with vendors.
- ✓ Develop an ongoing relationship with the vendor.

## 11. Implementation: Incorporate EHR systems into clinical and administrative operations

- ✓ Physician champions and other sponsors should be prepared for initial resistance and communicate organizational commitment when addressing any issues—staying the course on the adoption and use of an EHR system.
- ✓ Adoption of information technology to improve clinical care and increase efficiency could take 5 to 10 years. Realization of benefits of EHR systems is dependent on management action to change how care is delivered in the organization.
- ✓ Develop regular assessments of ongoing training needs, including just-in-time and follow-up training to increase the functionality of the system for providers.
- ✓ Hold operating management accountable for results and for ensuring the intersection of the quality and HIT agendas.
- ✓ EHR systems require a fundamentally different way of thinking and documenting for providers. Developing structured input supports, such as checklists, knowledge-based guidelines, or alerts requires changes to the way providers document.

## 12. Prepare for the future

- ✓ PHRs allow people to access and coordinate their own health information, and will likely grow in importance over time. Ensure that the EHR is part of an interoperable system and allows for PHR connectivity.
- ✓ Many communities are planning for Regional Health Information Networks that support health information exchange between all providers and other authorized users.

# Electronic Health Record Systems

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*Health information technology (HIT) is “the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of healthcare information, data, and knowledge for communication and decision-making” (Thompson and Brailer, 2004). A central element of HIT is the patient’s medical file.*

Currently, no standardized acronym has been established by the industry or the government to refer to an electronic version of a patient’s medical file. “Electronic Medical Record” (EMR) is perhaps the oldest term in use, and is often associated with electronic patient record systems within an enterprise. EHR is often considered the term most reflective of the actual patient experience of receiving healthcare across enterprises. In recent years, the term personal health record (PHR) has been used to refer to electronic health records for use by patients (and family caregivers). The PHR includes self-care and disease management information entered by patients, information from the medical record that is relevant to patients (e.g., care plan, medication regimen), and decision-supports (e.g., preventive service reminders, provider directories, and resources to assist patients in staying healthy and managing their chronic conditions) (NCVHS, 2001).

In 1991, the Institute of Medicine (IOM) introduced the term computer-based patient record (CPR) to refer to an electronic patient record accompanied by key features that support care delivery and clinical decision-

making, clinical and administrative operations and management, and external reporting (IOM, 1991). Later IOM reports use the term electronic health record (EHR) system (IOM, 2003).

## **IOM’s Key Features of a Computer-based Patient Record System**

1. Provides problem lists
2. Documents health status and functional levels
3. Documents clinical reasoning and rationale
4. Provides longitudinal and timely linkages with other pertinent records
5. Protects confidentiality and privacy and provides audit trails
6. Provides continuous authorized user access
7. Supports simultaneous user views
8. Access to local and remote information
9. Facilitates clinical problem solving
10. Supports direct entry by physicians
11. Supports quality assurance and cost tracking
12. Supports existing/evolving clinical specialty needs

Adapted from IOM, 1991

This *CEO Survival Guide*™ uses the following terms:

- **Electronic Health Record (EHR).** Computer-based longitudinal record of patient health information intended primarily for use by healthcare providers. A fully functional EHR incorporates all provider records of visits, hospitalizations, and other encounters with the healthcare system.
- **Personal Health Record (PHR).** Electronic patient records intended primarily for use by consumers. PHRs may or may not interface with providers' electronic records. PHRs are the focus of a forthcoming NQF *CEO Survival Guide*™.
- **EHR System.** An EHR system includes (1) longitudinal collection of electronic health information for and about persons, where health information is defined as information pertaining to the health of an individual or healthcare provided to an individual; (2) immediate electronic access to person- and population-level information by authorized, and only authorized, users; (3) provision of knowledge and decision-support that enhance the quality, safety, and efficiency of patient care; and (4) support of efficient processes for healthcare delivery (IOM, 2003). EHRs and PHRs are critical building blocks of an EHR system.
- **Health Information Technology (HIT).** HIT is used to refer to all types of information technology applications involving healthcare information including EHR systems, regional and national networks, wireless communication systems, telemedicine, and use of the Internet for health information exchange.

The choice of terms may not be a critical point for healthcare providers. Consistent use of terms within an organization, however, will help to facilitate clear communication.

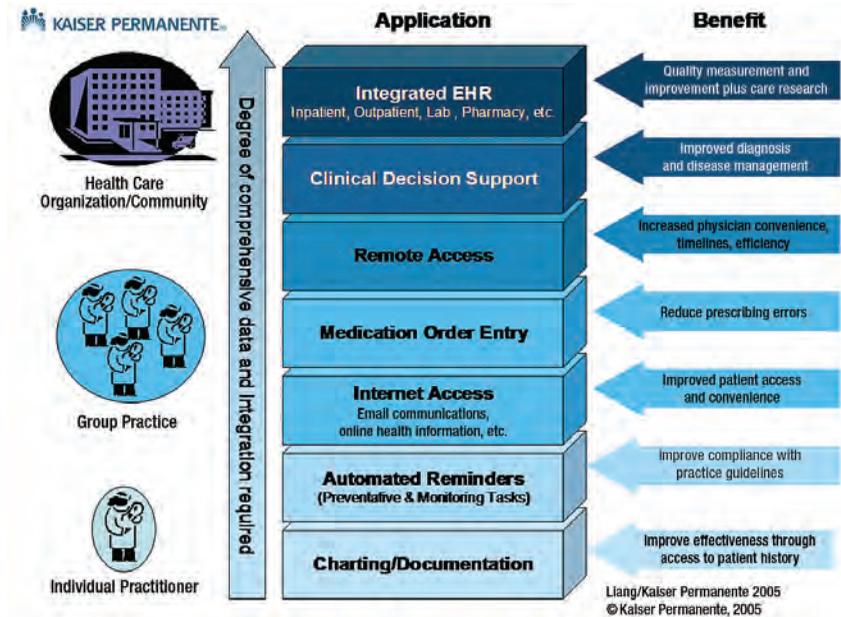
## Building Blocks of EHR Systems

Used to their full range, EHR systems allow providers to monitor patients at all times with electronic medical charts; support clinical decisions with evidence-based guidelines; expedite referrals to other specialists; computerize ordering of prescription drugs, laboratory tests, and images; and store and retrieve medical records from different locations. EHR systems provide a longitudinal record of events, decisions, and information pertaining to a patient's care that can support various administrative processes (e.g., internal quality improvement, billing) and public reporting and population health management (e.g., pay-for-performance reporting requirements, disease surveillance). For example, Exhibit 1 presents a schematic view of the building blocks of Kaiser Permanente's EHR System (Liang, 2005).

Of course, an ideal EHR system is far different from most EHR systems in use. Currently, use of EHR functions varies significantly, from basic word processing documentation through fully integrated electronic data collection and sharing.

EHR systems need not be implemented all at once, but the sequencing of applications is important. Initial investments should be in systems that can be built upon, and the components must be interoperable—able to exchange data and to work together. Some providers begin the process of building an

## EXHIBIT 1 Building Blocks of an EHR System: Example from Kaiser Permanente



The full benefit of investment in EHR systems will only be realized if these EHR systems are **interoperable**—able to exchange data across providers, sites, and organizations.

EHR system with computerized provider order entry (CPOE). More advanced applications of CPOE often move beyond the ordering of prescriptions and tests to include results reporting and various clinical decision-supports.

E-prescribing, as explained later, is likely to increase significantly with the expansion of Medicare to include prescription drug coverage, and may also serve as an entry

point into EHR systems. Basic e-prescribing, when implemented as an interoperable first phase of a more comprehensive EHR system, can serve as a platform for adding advanced features such as alerts.

Although quality and efficiency benefits accrue to individual providers who invest in EHR systems, the benefits increase significantly as the number of users and level of integration expands (Metcalfe's Law; Wikipedia, 2006). Patients with chronic conditions receive services from many clinicians and in multiple settings. As more and more providers in a community adopt EHRs that are part of an integrated system, the computerized patient data available to each provider becomes

more complete and comprehensive. In making decisions, each clinician has the benefit of knowing the diagnoses and treatment plans of other providers in the care team; the results of laboratory and imaging tests (trended over time, if appropriate); current and historical information on medications prescribed, including adverse reactions; and documented patient outcomes achieved.

### **Interoperability is a Key to Potential Efficiency Gains**

There is a compelling business case for establishing *national* standards for healthcare information exchange and interoperability, and for doing so expeditiously. National data standards are key to interoperability; they allow different information systems to access and share appropriate patient information securely, quickly, and privately. Other industries, such as retail and telecommunications, have experienced significant improvements in *productivity* due to the improvements in information technology, as well as changes in business practices (Bower, 2005; McKinsey Global Institute, 2001). If healthcare experienced even a fraction of those productivity improvements, widespread deployment of interoperable EHR systems could save the United States billions of dollars.

Some progress has been made toward the promulgation of national standards for healthcare information exchange and interoperability, but the United States still has a way to go. If the federal government, work-

ing collaboratively with the private sector standard setting bodies, fails to establish national standards, progress toward interoperable systems will be very slow and the benefits to the nation far less. Each healthcare organization would need to develop a specialized interface for each outside organization with which it communicates, and each interface is estimated to cost in the range of \$20,000 to \$50,000 (Walker et al., 2005). In the absence of national standards and interoperable systems, for a typical hospital that interacts with dozens and sometimes a hundred or more outside organizations, the costs of such interfaces would be substantial.

The nation would likely derive much value from the implementation of a fully standardized interoperable EHR system. Walker et al. (2005) estimate that the country would save \$77.8 billion annually in healthcare costs as a result of electronic data exchange among providers, laboratories, radiology centers, pharmacies, payers, and public health departments. These are conservative estimates that reflect only the savings associated with reduced redundancies (e.g., repeat laboratory tests because a provider is unaware that the tests have already been performed or lacks access to the results) and administrative costs (e.g., time spent on paperwork and phone calls to order and obtain test results). As discussed below, there are also other benefits of interoperable EHR systems including enhanced patient safety and chronic disease management.

Standardized electronic communications between providers and other healthcare organizations is estimated to save \$77.8 billion per year, approximately 5 percent of U.S. healthcare expenditures.

(Walker et al., 2005)

### **Improvements in Efficiency are Just the Tip of the Iceberg**

Improvements in efficiency are but one type of benefit to be derived from investment in interoperable EHR systems. There is a growing body of evidence on the potential to improve the safety and effectiveness of healthcare, and thus achieve substantial value (see Exhibit 2).

Developing comprehensive estimates of the savings associated with interoperable EHR systems can be difficult. The Office of the National Coordinator for Health Information Technology (ONCHIT) estimates

that the annual savings attributable to widespread EHR adoption, including savings resulting from improved safety and disease management, are likely to lie between 7.5 and 30 percent of annual healthcare spending. As shown in Exhibit 3, a comprehensive study by the RAND Corporation concluded that the potential benefits associated with improved prevention and management of chronic diseases are enormous (Hillestad et al., 2005).

The benefits outlined in the RAND work rest on many assumptions about sophisticated, integrated, interoperable EHR systems operating within a health information network with high levels of participation on the part of both providers and patients, and some have suggested that the projections are overly optimistic (Goodman, 2005; Himmelstein and Woolhandler, 2005). But even conservative estimates point to a sizable return on investment in EHR systems.

### **EXHIBIT 2 Improvements in Safety and Effectiveness**

- CPOE: Can reduce serious medication errors by 55 to 86 percent (Bates et al., 1998, 1999), and potential adverse drug events by as much as 84 percent (Bates et al., 1998).
- REMINDERS TO CLINICIANS AND PATIENTS: Increased provision of preventive services: influenza and pneumococcal vaccinations and screening for breast, cervical, and colorectal cancer (Balas et al., 2000; Shea et al., 1996).
- DISEASE MANAGEMENT PROGRAMS: Enhanced chronic disease tracking and compliance with clinical guidelines leads to better outcomes (Morris, 2003; Starmer et al., 2000).

**EXHIBIT 3 Annual Net Value from Interoperable EHR Systems  
(assuming 15 year adoption period)**

Benefits	
Efficiency .....	\$77.0 billion
Safety .....	4.5 billion
Chronic Disease Management .....	40.0 to 147.0 billion
	<hr/>
Total Annual Benefits .....	\$121.5 to 228.5 billion
EHR System Adoption Costs .....	.7.6 billion
<b>Net Value .....</b>	<b>\$113.9 to 220.9 billion</b>

Source: Hillestad et al., 2005

# The EHR Environment Right Now

*While national adoption rates for health information technology are slowly climbing, we are seeing a widening gap between larger hospitals and physician groups and their smaller counterparts. Physicians and providers face many barriers to adopting health information tools. We need to create incentives for providers to adopt electronic medical records and ensure the products they buy will do the job.*

*David Brailer MD, PhD (CDC, 2005)*

*National Coordinator for Health Information Technology*

## Physician Practice Settings

Physicians are increasingly relying on computer-based resources, which may encourage and enable eventual EHR system adoption.

However, EHR system adoption rates are still quite low. Surveys of ambulatory settings have found that less than one-third of physicians use EHRs with even rudimentary capabilities to support patient care (see Exhibit 4). One exception is from a survey conducted by the

American Academy of Family Physicians in 2005 that found substantially higher rates of EHR system adoption, but this is likely due to the web-based approach to sampling and conducting the survey.

Organizational and financial characteristics of practices, rather than individual physician characteristics, are most predictive of current EHR system adoption. The size of a physician practice is the most statistically significant predictor of whether outpatient visits are to physicians with clinical IT (Fonkych and Taylor, 2005; Reed and Grossman, 2004). Higher rates of adoption by larger practices are likely due to a combination of greater financial resources, ability to spread investment costs over greater numbers of providers, and more administrative capacity. Higher rates of EHR system adoption are found in particular clinical specialties, such as orthopedics and cardiovascular, probably because these specialists are more likely to have larger practices (10+ physicians) (Burt and Sisk, 2005).

## EXHIBIT 4 Adoption of EHR Systems by Physicians

RAND (2004) (Fonkych and Taylor, 2005)	15–20%
CDC Ambulatory Medical Care Survey (2001-2003) (Burt and Hing, 2005)	17%
Commonwealth Fund (2003) (Audet et al., 2004)	27%
AAFP's CHIT (2005) (AAFP, 2005a)	46%

**HIT adoption in ambulatory physician practice is positively correlated with:**

- Larger size
- Multispecialty practice
- Ownership by an integrated healthcare delivery system
- Increased managed care revenue

(Fonkych and Taylor, 2005)

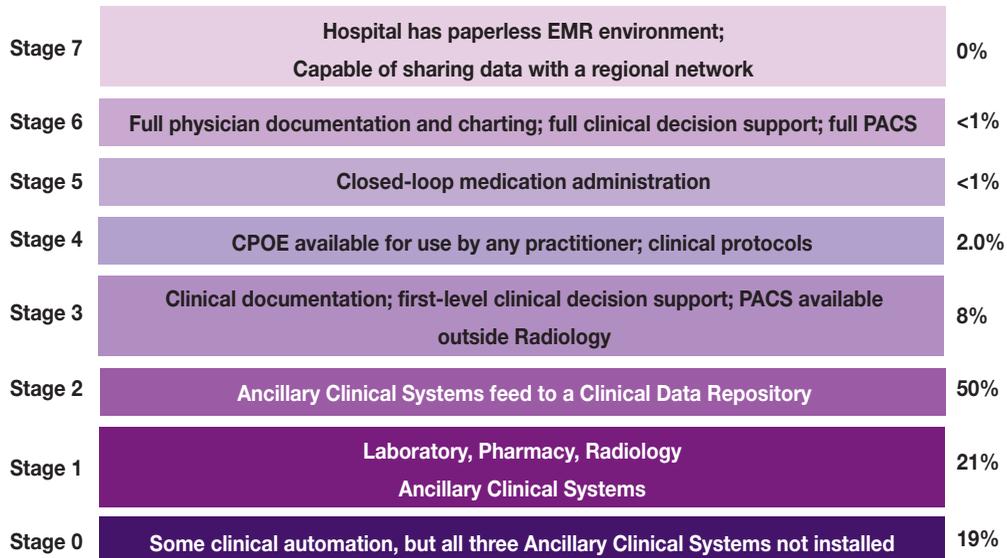
The sizable difference in EHR system adoption rates between large and small practice settings raises serious concerns and

policy issues since the majority of physicians practice in settings of fewer than 5 physicians (Kane, 2001). About 75 percent of Medicare outpatient visits are to physicians in practices with fewer than 50 physicians, indicating that the majority of Medicare outpatient visits (2001 data) were to practice settings with limited or no EHR system capacity (Grossman and Reed, 2005).

**Hospital Settings**

In larger, more complex settings, such as hospitals, EHR systems are often built over many years, often in stages, as outlined by HIMSS Analytics™ (see Exhibit 5). Only one in five

**EXHIBIT 5 Hospital Stages of Adoption of EHR System Applications**



Adapted from HIMSS Analytics™ database (derived from Dorenfest IHDS+ Database™), 2006.

hospitals has not yet started on this journey. The majority (80 percent) of hospitals have computerized laboratory, pharmacy, and radiology systems, and most have clinical data repositories that make these data available to clinicians and other authorized users. Far fewer hospitals have computerized clinical documentation and even fewer provide clinical decision-support to clinicians. Estimates of hospitals with CPOE range from 2 to 4 percent (Gale, 2006; HIMSS Analytics™, 2006).

### **Hospital adoption of clinical HIT is correlated with:**

- More beds
- Participation in multi-hospital system
- Less Medicare revenue
- Not-for-profit status
- Managed care involvement

(Fonkych and Taylor, 2005)

As was the case for ambulatory practices, greater organizational capacity is strongly associated with investment in EHR systems (Fonkych and Taylor, 2005). Larger hospitals and hospitals participating in multihospital systems are further down the road in adopting EHR systems. Not-for profit hospitals are more likely than for-profit hospitals to have invested in clinical HIT applications, especially academic and pediatric hospitals. Lastly, hospitals that derive a greater proportion of revenues from private insurance sources,

which have historically yielded higher profit margins, have been better positioned to invest in EHR systems (Fonkych and Taylor, 2005).

### **EHR Systems Developments on the Horizon**

Since May 2005, more than a dozen bills have been introduced in the House and Senate containing language to enable the development and adoption of electronic health records, and a nationwide HIT infrastructure to support them (DoBias, 2006). A few of these bills in particular appear as if they might move forward in the coming year (see Exhibit 6).

In addition, in December 2005, Congress passed the Fiscal Year 2006 DHHS Appropriations Bill, which included \$61.7 million for ONCHIT to be used for the development and advancement of an interoperable national HIT infrastructure.

**EXHIBIT 6 Recent Electronic Health Record System Legislation\***

Bill	Date Introduced	Summary	Current Status
S. 1418 Wired for Health Care Quality Act	7/18/2005	Facilitates the adoption of a nationwide, interoperable health information technology system through uniform privacy and security practices and standards for the electronic exchange of health information. Also, solidifies ONCHIT as the leader in coordinating HIT efforts.	Passed by the Senate, referred to House Subcommittee on Health on 12/16/2005 (will likely be matched with H.R. 4157)
H.R. 4157 Health Information Technology Promotion Act of 2005	10/27/2005	Facilitates efforts by hospitals to help physicians acquire new HIT (currently prevented by federal law). Also, calls for the establishment of uniform confidentiality and security standards. Solidifies ONCHIT as the leader in coordinating HIT efforts.	Referred to Subcommittee on Health on 11/4/2005
H.R. 4641 Assisting Doctors to Obtain Proficient and Transmissible Health Information Technology (ADOPT HIT) Act of 2005	12/18/2005	Provides tax benefits for healthcare professionals who invest in HIT.	Referred to Committee on Ways and Means on 12/18/2005

\*Current as of close of 109th Congress, 1st session

# The Provider “Value Equation” for EHRs

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*There is strong evidence that interoperable EHR systems are a good investment for the American public, but the value equation looks very different from the perspective of most providers. Providers bear most of the costs of EHR system implementation, but receive only a fraction of the benefits.*

## Provider Costs

Provider costs associated with EHR system adoption include: 1) EHR system acquisition and initial implementation costs, and 2) costs of short-term loss in productivity, ongoing training, redesigning clinical and administrative processes, and changing the way work is performed. In general, the EHR system acquisition and initial implementation costs are a small portion of the total cost.

There is wide variability in the way costs of EHR systems are accounted for and reported, making it difficult to obtain comparable estimates. Many factors also influence the cost of EHR system acquisition and initial implementation including the functionality of the EHR system being purchased, the size and scale of the healthcare setting, the extent and usefulness of existing “legacy” hardware and software, and the technical and business skills of the person negotiating pricing.

By far, the more significant costs of transitioning to an EHR system stem from implementing changes in clinical and administrative processes. EHR systems provide enormous opportunities to redesign care processes to be safer, more effective, and efficient; and to streamline administrative

processes. This requires ongoing and dedicated expertise and resources, and these costs are rarely reflected in the initial EHR system cost estimates.

Several analyses have attempted to quantify the costs associated with investment in EHR systems for ambulatory settings. The Markle Foundation/Connecting for Health Initiative estimated the costs per physician for implementing an EHR to be in the range of \$12,000-\$24,000 per year for small practices (Connecting for Health, 2004). These estimates include upfront acquisition costs, implementation assistance, as well as the impacts of volume-based revenue loss and lost productivity; however, they do not include full-scale interoperability or advanced EHR system functions. The American Academy of Family Physicians estimated the cost of a stand-alone (non-interoperable) EHR to be as low as just over \$5,500 per physician per year for the first 3 years—although this estimate includes very limited training and support costs and does not include the cost of lost productivity related to adoption (AAFP, 2005b). Other estimates per full-time provider are as high as initial investments of \$44,000 and ongoing costs of \$8,500 per year (Miller et al., 2005).

Not surprisingly, estimates of costs for hospitals are much more difficult to quantify and compare. One study estimates the aggregate costs for 90 percent of the hospitals in the United States to adopt EHR systems to be \$6.5 billion per year over a 15-year period (Hillestad et al., 2005). Although it is possible to extrapolate this to a per hospital amount of about \$1.3 million per year, this is probably not a very meaningful figure. On a per hospital basis, the adoption and implementation costs for EHR systems are extremely variable, depending on hospital size, level of existing information technology infrastructure, and whether the EHR system is implemented incrementally (e.g., starting with a single IT functionality, such as CPOE, or in one department of the hospital) or on a full-scale basis. Studies of the per hospital cost of implementing CPOE alone range from \$3 million to \$10 million generally spread over several years (Poon et al., 2004).

## Provider Financial Benefits

Providers derive some direct financial benefits as well as other intangible benefits from transitioning to EHR systems. Direct financial benefits include:

- **Increased efficiency or decreased costs associated with performing certain activities.** Some administrative and clerical costs should decrease, for example, the costs of transcribing dictated patient records, and preparing performance reports for internal and external quality monitoring purposes.

- **Increased provider productivity.** Over time, clinicians will spend less time completing paperwork and searching for patient records and test results.
- **Enhanced revenue.** More complete and accurate coding of claims and timely billing of payers can increase patient care revenues (Wang et al., 2003).

There are also potential negative revenue effects for providers, especially for those who derive revenues from fee-for-service payment programs. For example, under DRG-based payment programs, hospitals that invest in a computerized provider order entry system and achieve reductions in adverse drug events may actually experience a decrease in revenues. Physician fee schedules used by Medicare and many other payers provide payments for face-to-face visits and certain procedures, but fail to reward providers who use e-mail, PHRs, or remote monitoring systems to enhance patient understanding and compliance with treatment plans, and to respond in a more timely and efficient way to questions and concerns. Providers participating in prepaid payment systems—like capitated payment—do not experience the same effects of misaligned payment systems, and can actually derive value from decreased face-to-face visits and/or increased use of e-mail or telephone contacts (Garrido et al., 2005). This likely explains in part the higher rates of investment in EHR systems by prepaid health plans (Reed and Grossman, 2004).

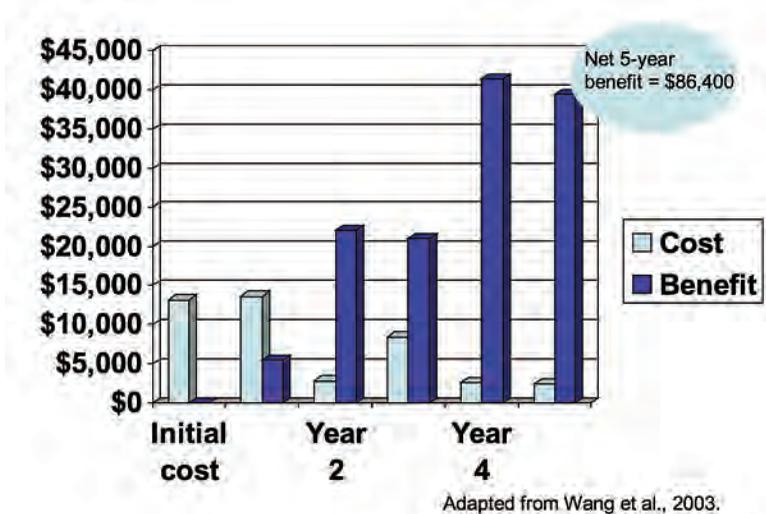
Immediate financial benefits are not the only motivating force or return on investment in EHR systems. In making HIT investment

decisions, providers must also consider the impact on their reputation in the community and their ability to develop and maintain strategic alliances with other providers. The strategic position of most provider organizations is to be the first choice for patients. Hospitals also want to be the first choice for physicians seeking privileges or making patient referral decisions. As the evidence continues to grow that EHR systems are a critical enabling factor for providing safe and effective care, the availability of EHR systems will likely play an important role in the decisions of patients and clinicians.

### Return on Investment

There is little quantifiable data in the literature on hospital returns on investment, but for ambulatory practices, the literature points to positive returns within three years (see Exhibit 7) (Miller et al., 2005; Wang et al., 2003). In addition, when the EHR system is integrated with a practice management system (total cost ~ \$70,000), the initial investment is recouped within two years as a result of cost savings from reduced transcriptions and revenue gains from more appropriate coding (AAFP, 2005b; National Business Coalition on Health, 2005).

**EXHIBIT 7 EHR Costs Versus Benefits Per Provider**





# Efforts to Speed HIT Adoption

*Numerous efforts to accelerate the adoption of HIT are currently underway in both the public and private sectors. The federal government is providing leadership and coordination through the Office of the National Coordinator for Health Information Technology (ONCHIT). ONCHIT was established within the Department of Health and Human Services (DHHS) in 2004 to facilitate the development and nationwide implementation of an interoperable health information technology infrastructure within the next 10 years (DHHS, 2005a).*

## Public and Private Efforts to Speed HIT Adoption

- Helping providers select and implement EHRs
- Encouraging adoption of EHRs through P4P and public reporting
- Establishing an e-prescribing system for Medicare recipients
- Building a national health information network
- Relaxing federal laws

ONCHIT and other federal entities are working in close collaboration with various private-sector partners to move forward this agenda. The Connecting for Health initiative sponsored by the Markle Foundation has been particularly important. Initiated in 2001, Connecting for Health is a collaborative of more than 100 public and private organizations, including experts in clinical medicine, information technology, public policy, consumer concerns, and patient

privacy (Connecting for Health, 2005a). Since its inception, Connecting for Health has encouraged the use of HIT by endorsing a set of healthcare data standards, identifying and studying privacy and security practices, defining key characteristics and benefits of consumer-controlled PHRs, and advocating a decentralized model for health information exchange (i.e., the “Common Framework”) (Connecting for Health, 2005b).

## Helping Providers Select and Implement EHRs

Efforts under way to fuel the adoption of HIT include movement toward a certification process for HIT products and provision of technical assistance to providers. Certification of EHR systems and their infrastructure or network components is important because it can be a high risk investment for a provider to select and invest in a particular EHR system. Concerns about whether the chosen system will provide the necessary functionality in both the short and long term and whether the vendor will remain in business to provide

upgrades and ongoing technical assistance are strong and valid.

In October 2005, the Certification Commission for Healthcare Information Technology (CCHIT), a private, non-profit organization, was commissioned by DHHS to develop and evaluate the certification criteria and inspection process for EHR systems (CCHIT, 2005). CCHIT is expected to not only help reduce the risk to providers of investing in EHR systems, but also to protect patient privacy through adequate security standards, help ensure interoperability, and facilitate the availability of incentives for provider adoption being offered by purchasers and payers.

CMS is also collaborating with private sector stakeholders to offer technical assistance to providers in HIT selection and implementation. Since 2005, Medicare Quality Improvement Organizations (QIOs) in every state are providing technical assistance to both hospitals and physicians for the adoption and use of health information technology, including e-prescribing, registries, e-labs, and deployment of full-scale EHR systems (AHQA, 2005). The QIOs are helping physicians with selecting EHR systems, as well as with reorganizing their practices in order to gain the maximum benefit of the new technology.

Another CMS-sponsored program that is offering technical assistance to small- and medium-sized physician practices is the Doctors' Office Quality-Information Technology (DOQ-IT) project (DOQ-IT, 2005a). DOQ-IT activities include: educating physician offices on EHR systems; providing information on the costs, risks, and benefits

of HIT adoption; conducting needs assessments for individual practices; and providing technical and quality improvement assistance.

## **Encouraging Adoption of EHRs through Pay for Performance and Public Reporting Programs**

Both public and private purchasers are promoting adoption of HIT through pay for performance (P4P) programs. There are now about 100 private sector P4P programs and numerous Medicare demonstrations and pilot projects that provide financial rewards to providers based on performance. These projects generally measure several dimensions of quality and provide rewards to the highest quality and most efficient performers. Since good EHR systems can enhance a provider's ability to deliver safe and effective care and to do so efficiently, P4P programs help to increase a provider's rate of return on investment in EHR systems.

Some P4P programs also provide direct financial rewards for the adoption and use of HIT. For example, the Medicare Care Management Performance Demonstration, which is focused on solo practitioners and small group practices, awards bonuses to its participants for the adoption of HIT, and provides technical assistance through local QIOs (CMS, 2005). Several of these projects also involve public reporting of providers' performance, thus providing further incentive to providers to improve the quality of their care and be able to effectively report out their results.

Greater investment in HIT today will likely be critical to participating in, and benefiting financially from, P4P programs in the future. As measure sets become more comprehensive and include more granular measures of clinical quality, it will no longer be feasible for healthcare organizations to derive the necessary data from administrative or claims files or manual abstraction of samples of medical records. Healthcare providers of all types will need EHRs. Those that do invest in EHRs will find that having immediate access to more complete patient information at the point of care, along with clinical decision-supports (i.e., prompts and alerts), will serve to improve the safety and effectiveness of the care they provide. More information on P4P programs can be found in *NQF's CEO Survival Guide™ to Pay for Performance*.

### **Establishing an E-prescribing System for Medicare Recipients**

As noted earlier, e-prescribing is widely viewed as a first step toward more comprehensive EHR systems. In January 2006, a voluntary prescription drug benefit became available for all Medicare recipients under the Medicare Prescription Drug, Improvement and Modernization Act of 2003 (known as Medicare Part D). This legislation fosters e-prescribing by requiring that plans participating in Part D support electronic prescription programs (DHHS, 2005h). Plans are required to comply with a set of standards for interoperability in order to allow electronic transmission of prescriptions from a physician to the patient's pharmacy of choice (DHHS, 2005i).

In addition, CMS will be awarding \$6 million to fund pilot e-prescribing programs (DHHS, 2005h).

### **Building a National Health Information Network (i.e., interoperable EHR systems)**

Integral to building a national health information network is the specification of data standards to assure interconnectivity and interoperability of HIT. The federal government has for some years been encouraging the use of common data standards. The Consolidated Health Informatics initiative, located within ONCHIT, has endorsed a portfolio of existing health information interoperability standards for use by federal agencies with health-related missions (DHHS, 2005b). As the largest purchaser of healthcare services, the federal government has a good deal of leverage when it comes to promoting the use of common data standards.

To further support a national network, in 2005 the Secretary of DHHS established the American Health Information Community (AHIC)—a 17-member commission made up of public- and private-sector representatives (DHHS, 2005d). The purpose of AHIC is to provide input and recommendations to DHHS on the development and adoption of architecture, standards, a certification process, and a method of governance for the ongoing implementation of HIT and ultimately the establishment of a National Health Information Network (NHIN) (DHHS, 2005e).

Other efforts fueled by the federal government to accelerate the development of an NHIN include a set of 16 community health IT grants, totaling over \$22.3 million, awarded by the Agency for Healthcare Research and Quality (DHHS, 2005f). These projects are focused on data sharing and interoperability among providers, laboratories, pharmacies, and patients in several regions across the country. DHHS has also awarded contracts totaling \$18.6 million to four consortia of technology developers and healthcare providers to develop prototypes for an NHIN (DHHS, 2005g). These groups will each develop an architecture and network for secure information sharing among hospitals, laboratories, pharmacies, and physicians in their own market areas; and will also work together to ensure that information can move seamlessly between each of the four networks.

On the private sector side, Connecting for Health has initiated a National Health Information Exchange initiative (Connecting for Health, 2005c). This initiative, which is being funded by the Markle Foundation and The Robert Wood Johnson Foundation, involves three very different local health information networks—in Boston, MA, Indianapolis, IN, and Mendocino, CA—that will work together to facilitate the secure exchange of health information between each of them.

## Relaxing Federal Laws

Another effort at the federal level to help speed the adoption of HIT by physicians is the proposed regulations intended to relax the federal physician self-referral law (“Stark Law”) and anti-kickback statute. These laws are aimed at preventing payments to clinicians that might induce them to overutilize healthcare services. Although probably an unintended consequence, these laws have also created barriers to hospitals’ providing financial and other assistance to physician practices to help with the acquisition of new HIT. In 2005, CMS requested Congress consider revisions to these laws to permit hospitals to provide subsidies to physicians for both e-prescribing and EHR systems under the Stark Law and for e-prescribing under the anti-kickback statute. Congress has yet to act on this request.

# Role of Healthcare Executives in EHR System Implementation

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*EHR system implementation is not about information technology alone; it is about transforming clinical and business practices. EHR systems and other HIT are an enabling foundation for healthcare—and organizational—reform. The technology does not, in and of itself, cause the reform.*

## What should healthcare executives do to leverage EHR systems?

- Strategy development
- Sponsorship
- Organizational readiness
- Financing
- Application Selection
- On-going management

Successful EHR system implementation requires leadership over extended periods of time by executives, boards, and clinical staff. The chief executive officer and senior management team must articulate the vision for using EHR systems, lead the organizational transformation necessary to realize the promise of the technology, and be accountable for the results. Successful implementation of EHR systems requires executive leadership to drive the intersection of the quality and HIT agendas. The chief information officer has a critical role to play in EHR system implementation, but cannot do the job alone.

Based on their combined experiences and insights, the NQF Task Force on

Electronic Health Record Systems offers the following framework for what healthcare executives should *do* to leverage EHR systems.

## Strategy Development

Healthcare executives should first develop a vision for redesigning patient care, and then develop an HIT strategic plan *that supports the vision of patient care* and guides the enterprise-wide planning and management of HIT applications and architecture. The HIT strategic plan should clearly articulate why the EHR system is needed, the expected benefits, realistic hurdles of implementation, and the organizational infrastructure that will support the implementation. This vision for EHR system implementation should include a “value proposition” for providers, for example, the return for the upheaval of doing work differently is the benefit of increased decision-support and improved quality of care for patients.

It is particularly important to create an “enterprise” mindset to HIT. Many organizations have legacy or “boutique” systems and departments where specialized HIT

applications have evolved in a silo. The information technology plan should include an assessment of these boutique systems, and a plan to ensure that connectivity is the foundation for all specialized applications. With this master plan in place, the CIO should be able to map all planned applications to the strategic plan and architecture. This includes identification of legacy systems that may need to sunset.

The HIT strategic plan should position the EHR as the single source of integrated patient information. The organization must be clear on the degree to which an EHR *system*—versus interoperable components—is being implemented. EHR systems need not be built all at once, but it is important that each application be selected for its ability to contribute to patient-centered EHR system goals (i.e., the seamless provision of high quality, coordinated patient care across sites and providers and over time). The strategic plan and enterprise mindset are important to avoid the establishment of site-of-care-specific or provider-focused applications that may have short-term benefits, but create delays and necessitate costly rework over the long-term.

The strategic plan should assume that the organization will work with multiple vendors to build the EHR system. There is currently no single vendor that provides a complete EHR system with all the needed functionality. Simply stated, interoperability should be the first-line decision point for selection of EHR system components. Commercial viability of the vendor is also critical.

For health systems, the strategic plan should include an approach to connectivity

with other community providers. Connectivity and shared quality goals will position the hospital and the community providers for P4P, and increase the potential sources of efficiency for all providers. There may be opportunities for larger institutions to provide financial and technical support to smaller providers.

## Sponsorship

Successful implementation of EHR systems requires the committed support of key stakeholders at all levels. Champions will be needed to communicate the need for the EHR system, and to help chart and successfully navigate an implementation course.

One approach is to engage clinical leaders and other key stakeholders in the development of a set of common goals that prioritize the functionality needed in the system. The goals can be used to guide decision-makers' understanding and review of available EHR system solutions. Early development of the goals will set the stage for site visits and financing decisions, and make the application selection process easier.

Strong, committed clinical champions are particularly important. Clinical leaders are a critical communication link between administration and front-line EHR system users. Their input is invaluable in assessing the extent and pace of changes in practice that will be acceptable given the clinical culture of the organization. Clinical champions help to identify the differences between “what would be nice” to have in an EHR system and “what is essential for success” (Ash 2003). For large institutions, having a

*set* of physician champions, representing key medical specialties including medicine, surgery, emergency medicine, obstetrics, and others is a critical readiness factor. Other important stakeholders include nursing, pharmacy, and clinical support groups such as respiratory therapy.

The committed support of members of the board of trustees is another critical readiness factor. In a similar way to the champions, trustees need to understand the implementation challenges, and the factors that have contributed to success and failure at other organizations. The Board's understanding of the short- and long-term investments in capital and human resources, and the effects on clinical practice, will be necessary throughout the process.

Finally, engage standing committees and existing workgroups in preparing the organization for EHR implementation. This will provide additional sponsorship and oversight to the process. These committees require the active involvement of the CEO and/or COO in order to ensure accountability for identification and implementation of the needed operational changes. Technical support should be provided to these existing groups, as needed.

## **Organizational Readiness**

Successful implementation of EHR systems depends on organizational culture and readiness. Implementation of an EHR system will magnify gaps, inconsistencies, and complexities in work processes. Initially, implementation poses an immediate threat of process disruption, and this has been a barrier to

widespread adoption. Achieving EHR system benefits depends on provider capacity to manage the introduction of new technologies with the concurrent changes in workflow and culture (Coye, 2005).

Executives can learn from the HIT experience of other industries, while recognizing that healthcare has unique characteristics. The adoption of information technology to improve clinical care and increase efficiency could take 5 to 10 years. Time will be needed to redesign clinical and administrative operations to take full advantage of the improvement opportunities that the EHR system presents.

Reengineering clinical and administrative processes to prepare for EHR system implementation will require operational managers or management engineers to assess and modify workflow; clinical informatics specialists to understand and interpret organization-specific clinical realities that will affect use of the new system; and trainers to prepare the workforce for new models of providing care. Engaging in the “pre-work” of reengineering (e.g., identifying order sets, reviewing the evidence) and testing the changes to the extent possible with current systems will make the implementation easier. Organizational culture and readiness will dictate how much reengineering can occur during the initial phases of HIT implementation, or must wait until after the technology is in place. Executives should engage formal and informal clinical leaders in making this decision. Their ongoing support for the process will be critical as medical, nursing, and other clinical staff adapt to the significant changes.

A phased implementation of the system is probably preferred, depending on organizational readiness. Identify what will be learned in the early phases, and establish a mechanism for adjudicating suggested revisions to the system. Avoid “pilot” terminology, as this implies the possibility of a go/no-go decision at the end of the pilot period. Keep in mind that operating and maintaining existing systems must continue during the transition to the new system.

Healthcare executives must also set realistic expectations, especially in terms of the immediate impact of EHR systems on productivity and efficiency. It is critical to understand how EHR systems will both alter and integrate into the current environment and workflow. It is unrealistic to expect that EHR systems will make clinicians more efficient in the short term.

Don't sell happiness; sell reality. EHR system implementation is not fun or easy. It will seem inefficient in the short term. The true benefits will not be felt for several months. Be prepared to respond to unforeseen consequences. Expect a demand from some unhappy providers to shut the system down. Make sure the board is ready to “stay the course.”

NQF Task Force on EHRs

EHR systems require clinicians to adopt a fundamentally different way of documenting and making clinical decisions. Therefore, clinicians should expect to work longer hours

during the initial phase of implementation when they are becoming familiar with the application, and entering background clinical information for each patient (Miller, 2005). In addition, decision support is more powerful and useful if the input data are structured and coded, so clinicians will need to adapt to structured input supports, such as checklists. Clinicians will also be required to respond to computerized prompts that help to assure compliance with evidence-based practice guidelines, and to alerts that improve patient safety by informing providers of potentially hazardous situations.

Due to these significant changes, the need for innovative organizational training programs cannot be overstated. Prepare for up-front training, but recognize that providers will only assimilate a small portion of the EHR system capabilities initially. Ongoing, repetitive, just-in-time training is needed as clinicians become ready over time to utilize additional functionality in the system. Shadowing, train-the-trainer, temporary workforces, and other training methodologies can be adapted to the culture and readiness of the organization.

Physician champions should also expect significant time investments in the initial implementation phase. Changes in processes to improve efficiency and quality, such as revising order sets and patient flow procedures, require an investment of dedicated time from the champions. These changes in processes are the foundation to maximizing the organization's return on investment.

Communication is key to successful implementation of an EHR system. To

enhance organizational readiness, a broad communication strategy will be needed to promote understanding of the:

- targeted improvement opportunities,
- specific EHR system implementation goals, and
- expected changes in the organization and its work processes.

Healthcare executives will want to identify and use the formal and informal channels of communication that exist in every organization to address the communication needs of leadership, management, clinicians, and front-line staff.

Environmental factors may also affect organizational readiness for EHR systems. Many states have antiquated regulations based on paper records that may restrict use of electronic signatures and some other functionality of EHR systems. Executives must understand state regulatory requirements and processes, and work through state hospital associations to effect needed changes in statute or regulation.

## Financing

EHR systems require a multi-year commitment and investment strategy. Healthcare executives and boards of trustees should commit to a specific level of investment each year for a minimum of five years, whether as capital or incurred expenses. It is best to avoid an annual re-negotiation over the amount of EHR system investment during these early years, because the very challenging nature of implementation may cause short-sighted reductions in organizational commitment.

Before reviewing detailed budget implications, healthcare executives and trustees should take a comprehensive view of the costs and benefits of EHR systems. As discussed above, some of the changes in care processes enabled by EHR systems (e.g., more effective use of preventive services, enhanced disease management programs) improve patient safety and quality, but may also reduce fee-for-service revenues (e.g., fewer office visits, shorter hospital lengths of stay, and fewer readmissions resulting from reductions in adverse events and complications). It will be important to assess whether there is pent up demand for services in the community to back-fill the capacity. Additionally, HIT investment may have important implications for a hospital's capital planning and human resource management processes. For example, many organizations are currently involved in human resources planning for anticipated shortages in the allied health workforce, and a high-level analysis of the implications of fewer diagnostic tests—like MRIs, for example—may demonstrate that additional equipment and staff are not needed as current planning would suggest.

For healthcare organizations, the business case for investing in EHR systems is highly dependent on type and size of organization, extent to which equipment and systems will be standardized across the enterprise, current systems and architecture in place, and features and connectivity of the planned application. Vendors tend to focus on software costs only, and lack a standardized format to present costs, so side-by-side comparisons are difficult. Anecdotal information suggests that the

hardware and software costs represent as little as one-fifth of the total costs. An estimate of costs should include site visits, implementation planning, training, execution, and on-going training and system support. Additional resources for work process redesign pre- and post-implementation will be needed.

## Application Selection

Selecting key decision-makers and champions, developing common goals and functionality, and conducting site visits are the foundation for application selection. Hundreds of vendors make products that can be called EHRs or EHR systems, but preferably consider only vendors and products that have developed interfaces with your current systems, and that have been proven successful in organizations of a similar size. As product certification becomes available, look for certified EHR products to gain some assurance that the EHR systems have the capabilities and benefits needed for the organization.

The application selection process is an important opportunity to engage key stakeholders. All champions will need to gain some degree of product knowledge and understanding of the impact of EHR system implementation on clinicians and the organization. Team site visits are one of the most effective means of educating champions on the enablers and barriers to implementing and using EHR systems. Teams should use site visits to learn about the impact of EHR systems on workflow (e.g., alert fatigue and other unintended consequences) and to prepare for the significant challenges, hidden objects, and blind curves that most

organizations face during implementation. Consider engaging the board of trustees in vendor demonstrations or more innovative ideas, such as electronic “virtual tours” of a patient’s experience in a setting that has an EHR system.

Clinical champions are critical decision-makers when it comes to the selection of applications. Clinicians understand the capabilities EHR systems must have to support clinical decision-making and patient care. They can assess the impact of EHR systems on clinical practices and identify strategies for mitigating clinician resistance to change. The clinical leadership also will be called upon to defend the choices.

There are many “vendor-neutral” resources available to hospitals, physician offices, and other provider organizations. To help providers to migrate from paper-based health records to EHR systems that suit the needs and goals of the organization, many of these resources offer implementation and quality improvement assistance, including detailed education and tools on EHR system solutions and alternatives, the RFP process, negotiation, and contracting with vendors. For example, for physician offices, step-by-step resources and tools are available from DOQ-IT, with a detailed list of references called “EHR Systems Selection: Selected Resources, Mapping Practice Needs, Choosing a System, and Contracting” (DOQ-IT, 2005b). In addition, Medicare QIOs are providing technical assistance to both hospitals and physician offices for the adoption and use of HIT. And, many professional organizations, trade associations, and

industry websites also have EHR system planning, selection, and implementation resources.

## Ongoing Management

During the first few months of the implementation phase, strong leadership, open communication, and rapid response to problems will all be essential to maintain momentum and support from key stakeholders. Many EHR system implementations have faltered because leadership has failed to respond quickly and adequately to problems that arose during and after the “go live” period. For larger organizations that operate at all times, a “command center” staffed with executive and clinical leaders and experts in clinical informatics and information technology should be available at all hours during the first several days of “go live.”

Expect and plan for concerns or resistance from clinicians and do not underestimate the disruption the system implementation will have on individuals. Expectations that EHR systems will make documentation “easier” in the short term may be true for nurses, but it has not been shown for physicians. Physician champions and other sponsors should be prepared for this initial resistance and demonstrate strong organizational commitment to address concerns, while at the same time, staying the course.

A mission-critical component of implementation is the availability of ongoing training for providers. A pre-implementation training class is not sufficient; immediate, live help must be available to providers. This

intensive, ever-present training support (in the first days or weeks) should be available at the point of care to support clinicians. Post-implementation support has been found to be a significant component of successful implementations (Ash et al., 2003).

In the immediate post-implementation period, clinical staff productivity will likely decrease, and staffing levels should be planned to reflect this. Continued review of the EHR impact on staff will be necessary to ensure the accomplishment of organizational goals. It is wise to conduct periodic assessments of the need for ongoing training, including just-in-time and follow-up training to increase the functionality of the system for providers.

Mechanisms for feedback and system modification need to be in place to adjust to problems in implementation. It is also possible, even likely, that implementation of an EHR system will result in the creation of new types of unanticipated medical errors. There needs to be a process for responding to concerns and problems, testing solutions without putting patients at risk, and improving the system on a regular basis. This will need to be an ongoing process, because the EHR system will continually be upgraded to incorporate new knowledge and tools for evidence-based medicine, care management, and process improvement.

## Hidden Objects, Blind Curves, and Too Late to Turn Back

As the number of providers implementing EHR systems increases, the knowledge base of unintended consequences and avoidable mis-

takes continues to grow. NQF's Task Force on Electronic Health Record Systems offers the following anecdotal experiences and lessons from the literature and their own first-hand experiences that may help healthcare executives in various phases of EHR system implementation:

- Planning for EHR systems often occurs in isolated workspaces, but this does not mimic the real environment in which clinicians experience constant interruption and multi-tasking. Wrong-patient ordering can be common with many activities occurring simultaneously. The human-computer interface must be designed for highly interruptive use (Ash et al., 2004).
- When CPOE is fully implemented and both physicians and nurses are using the electronic tool, the interpersonal relationship between the physicians and nurses changes significantly. The physician is less likely to encounter the nurse face-to-face and some communication that used to transpire is no longer there. Clinicians may consider various teamwork and communication tools to ensure that patient safety and care are not compromised.
- Use of structured, encoded data is important for organizations to gain full benefit of EHR systems, but over-emphasizing structured input is time-consuming for clinicians and can cause cognitive overload (Ash et al., 2004). The design of structured inputs should take into consideration the way clinicians receive, process, and use information for clinical decision-making.
- A significant number of hospitals that have implemented CPOE fail to reap the full potential benefits. For example, many still re-enter medication orders in the pharmacy due to pharmacy interface issues, complex medication ordering processes, and special procedures applicable to certain chemotherapy and intravenous orders. Plan for these frequently encountered problems and seek solutions early in the process.
- The proper identification of patients associated with medications at bedside can be challenging and this is a process that no single vendor typically watches over. Careful planning is required to identify how vendors will work together to assure this capability.
- Operating an EHR system where a portion is still paper-based creates operational workarounds and potential patient harm issues if not carefully thought through.
- It is critical to have as close to full-time live operation 365 days a year, but there will be a system failure sooner or later for whatever reason (e.g., power outage, network failure). It will be critical to have a full work-around plan in place.
- In EHR system planning and implementation, three key areas that need special attention due to complexity and the very critical, life saving nature of their services are the emergency department, operating rooms, and intensive care units.

In summary, conventional wisdom suggests that healthcare executives should expect the unexpected and be prepared to be surprised.

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